What is claimed is:

1. A method for forming a thin film aerogel on a semiconductor substrate, the method comprising the steps of:

a) providing a semiconductor substrate comprising a microelectronic circuit;

b) depositing an aerogel precursor sol upon said substrate; wherein said aerogel precursor sol comprises

a metal-based aerogel precursor reactant, and

a first solvent comprising a first polyol; wherein,

the molar ratio of said first solvent molecules to the metal atoms in said reactant is at least 1 : 16 .

c) allowing said deposited sol to create a gel, wherein said gel comprises a porous solid and a pore fluid; and

d) forming a dry aerogel by removing said pore fluid.

2. The method of claim 1, wherein:

said first polyol is glycerol.

3. The method of claim 1, wherein:

said first polyol does not comprise a glycol.

4. The method of claim 3, wherein:

said first solvent also comprises a second polyol.

5. The method of claim 4, wherein:

said second polyol comprises a glycol.

6. A method for forming a thin film nanoporous dielectric on a semiconductor substrate, the method comprising the steps of:

a) providing a semiconductor substrate;

b) depositing an aerogel precursor sol upon said substrate; wherein said aerogel precursor sol comprises

a metal-based aerogel precursor reactant, and

a first solvent comprising a polyol; wherein,

the molar ratio of said first solvent molecules to the metal atoms in said reactant is at least 1 : 16 .

c) allowing said deposited sol to create a gel, wherein said gel comprises a porous solid and a pore fluid; and

d) forming a dry, nanoporous dielectric by removing said pore fluid.

7. The method of claim 6, wherein:

said polyol is glycerol.

8. A method for forming a thin film nanoporous dielectric on a semiconductor substrate, the method comprising the steps of:

a) providing a semiconductor substrate;

b) depositing an aerogel precursor sol upon said substrate; wherein said aerogel precursor sol comprises

an aerogel precursor reactant selected from the group consisting of metal alkoxides, at least partially hydrolyzed metal alkoxides, particulate metal oxides, and combinations thereof, and

a first solvent comprising a polyol; wherein,

the molar ratio of said first solvent molecules to the metal atoms in said reactant is at least 1 : 16 .

c) allowing said deposited sol to create a gel, wherein said gel comprises a porous solid and a pore fluid; and

d) forming a dry, nanoporous dielectric by removing said pore fluid without substantially collapsing said porous solid.

9. The method of claim 8, wherein:

the molar ratio of said first solvent molecules to the metal atoms in said reactant is no greater than 12 : 1.

10. The method of claim 8, wherein:

the molar ratio of said first solvent molecules to the metal atoms in said reactant is between 1 : 2 and 12 : 1.

11. The method of claim 8, wherein:

the molar ratio of said first solvent molecules to the metal atoms in said reactant is between 2.5 : 1 and 12 : 1.

12. The method of claim 8, wherein:

said nanoporous dielectric has a porosity greater than 60% and an average pore diameter less than 100 nm.

13. The method of claim 8, wherein:

said forming step is performed in a drying atmosphere, wherein the pressure of said drying atmosphere during said forming step is less than the critical pressure of said pore fluid.

14. The method of claim 8, wherein:

the temperature of said substrate during said forming step is above the freezing temperature of said pore fluid.

15. The method of claim 8, wherein:

said forming step is performed in a drying atmosphere, wherein the pressure of said drying atmosphere during said forming step is less than the critical pressure of said pore fluid,

the temperature of said substrate during said forming step is above the freezing temperature of said pore fluid, and

wherein, said method does not comprise the step of adding a surface modification agent before said forming step.

16. The method of claim 8, wherein:

said forming step is performed in a drying atmosphere, wherein the pressure of said drying atmosphere during said forming step is less than the critical pressure of said pore fluid,

the temperature of said substrate during said forming step is above the freezing temperature of said pore fluid, and

said nanoporous dielectric has a porosity greater than 60% and an average pore diameter less than 100 nm;

wherein, said method does not comprise the step of adding a surface modification agent before said forming step.

17. The method of claim 8, further comprising the step of:

aging said gel.

18. The method of claim 17, wherein:

at least part of said aging step is performed in a substantially closed container.

19. The method of claim 17, wherein:

the temperature of said gel during said aging is greater than 30 degrees C.

20. The method of claim 17, wherein:

the temperature of said gel during said aging is greater than 80 degrees C.

21. The method of claim 17, wherein:

the temperature of said gel during said aging is greater than 130 degrees C.

22. The method of claim 8, wherein:

said porous solid has less than 2% permanent volume reduction during said pore fluid removal.

23. The method of claim 8, wherein:

said porous solid remains substantially uncollapsed after said pore fluid removal.

24. The method of claim 8, wherein:

said porous solid has less than 5% volume reduction during said pore fluid removal.

25. The method of claim 8, wherein:

said porous solid has less than 1% volume reduction during said pore fluid removal.

26. The method of claim 8, wherein:

said allowing step is performed in a gelation atmosphere, wherein the concentration of a vapor of said first solvent in said gelation atmosphere is not actively controlled.

27. The method of claim 8, wherein:

said allowing step is performed in a gelation atmosphere, wherein the concentration of a vapor of said first solvent in said gelation atmosphere is substantially uncontrolled.

28. The method of claim 8, wherein:

said polyol is glycerol.

29. The method of claim 8, wherein:

said reactant is a metal alkoxide selected from the group consisting of tetraethylorthosilicate, tetramethylorthosilicate, methyltriethoxysilane, 1,2-Bis(trimethoxysilyl)ethane and combinations thereof.

30. The method of claim 8, wherein:

said reactant is tetraethylorthosilicate.

31. The method of claim 8, wherein:

said dry, porous dielectric has a porosity greater than 60%.

32. The method of claim 8, wherein:

said dry, porous dielectric has a porosity between 60 % and 90%.

33. The method of claim 8, wherein:

said dry, porous dielectric has a porosity greater than 80%.

34. The method of claim 8, wherein:

said dry, porous dielectric has a porosity greater than 30%.

35. The method of claim 8, wherein:

said dry, porous dielectric has a porosity greater than 45%.

36. The method of claim 8, wherein:

said dry, porous dielectric has a porosity between 15% and 40%.

37. The method of claim 8, wherein:

said precursor sol comprises a gelation catalyst.

38. The method of claim 8, further comprising the step of:

adding a gelation catalyst after said deposition.

39. The method of claim 8, further comprising the step of:

replacing at least part of said pore fluid with a liquid before said removing pore fluid step.

40. The method of claim 39, wherein:

said liquid comprises acetone.

41. The method of claim 8, further comprising the step of:

annealing said dry, porous dielectric.

42. A method for forming a thermal insulator on a semiconductor substrate, the method comprising the steps of:

a) providing a semiconductor substrate;

b) depositing an aerogel precursor sol upon said substrate; wherein said aerogel precursor sol comprises

a metal-based aerogel precursor reactant, and

a first solvent comprising a polyol; wherein,

the molar ratio of said first solvent molecules to the metal atoms in said reactant is at least 1 : 16 .

c) allowing said deposited sol to create a gel, wherein said gel comprises a porous solid and a pore fluid; and

d) forming a dry, thermal insulator by removing said pore fluid.